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ABSTRACT

Guidelines for the design of instructional materials are outlined in this paper. The principles of design are presented in five major categories: (1) general design (structural appeal and personal appeal); (2) instructional design (attention, memory, concept learning, and attitude change); (3) visual design (media considerations, pictures, graphs and diagrams, words-projected, words-print, and color); (4) text design (content and writing style); and (5) audio design (functions, structure, and the recording). A brief description is provided for each of the various facets of the principles listed. (14 references) (EW)

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Designing Instructional Materials

Some Guidelines

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The process of designing effective instructional materials depends first on careful planning which is a complex procedure that involves:

- Analyzing the specific educational or training needs
- Knowing the specific physical, socio-economic, educational, and psychological characteristics of your audience
- Determining the psychomotor, cognitive, and affective objectives that are to be met
- Delineating the content to be communicated
- Deciding the most appropriate teaching and learning strategies
- Evaluating each step of the process

Based on careful planning instructional materials can be designed following principles that fall into five major categories:

- General Design
- Instructional Design
- Visual Design
- Text Design
- Audio Design

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There are a number of principles of design, or guidelines, that can be suggested in each of these five categories.

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GENERAL DESIGN PRINCIPLES

Structural appeal

Clarity

- In order to present information so it is clear to the learner you must use logical organization, divide complex information into small units, and present crucial information at the beginning and at the end of a presentation.
- Provide a clear orientation, using introductions and summaries, and be sure to show a visual overview before focusing in on visual details.

Emphasis

- Use visual and verbal cues plus repetition to emphasize key elements of your presentation.

Pacing

- Use pacing that considers the learner, the subject matter, and the desired response.

Visual/verbal Reinforcement

- Be certain the verbal and visual elements are reinforcing each other and are not communicating different messages.

Personal appeal

- Be certain your audience understands the positive consequences of the learning.
- Use examples that are familiar to the audience.
- Use a learner's viewpoint: This is particularly important in "how to" materials.
- Do not exceed the perceptual capacity of the learner.
- Use questions-where appropriate-to keep your audience involved.

INSTRUCTIONAL DESIGN PRINCIPLES

Attention

Attract

- Use variations in size, color, brightness, and shape or employ novel visuals to attract attention.

Hold

- To hold attention, be certain that the material presented is meaningful to the learners.
- Consider the complexity of visual materials: Very simple or very complex visuals do not hold attention as well as moderately complex visuals.

Perception

- Perception is relative, so use size indicators and consider what is seen simultaneously and sequentially.
- Perception is selective, so limit the amount of information presented. Use only pertinent information, and provide visual and verbal cues to focus attention on key points.
- Perception is organized, so arrange material logically in keeping with the subject matter. Use arrows, numbers, or other cues to direct the learner's perceptions.
- Perception is influenced by expectations, so use appropriate formats and cues such as headings or instructions to aid the learner in knowing what to expect. High quality graphics and photography can increase the expectation that the material being presented is important.

Memory	• Memory is facilitated when material is meaningful to the learner. • Memory is aided by associating unknown items with known items. • Repetition facilitates remembering. • Memory depends on consequences. • Using concurrent modes; i.e., words and pictures, promotes recall. • Objects and pictures of objects are remembered better than just their names. • Organizers can provide a structure that aids memory. • Questions can focus attention and facilitate recall.
Concept learning	• Conceptual learning can be increased by using a variety of examples and non-examples. • Use realistic pictures to show what things look like. Use simplified pictures to eliminate extraneous information. • Combine names with pictures to increase conceptual learning. • Put criterial items in list form; do not embed them in a sentence.

Attitude change	• Attractive and credible presenters contribute to positive attitude change. • To promote attitudinal change be sure to organize the message carefully: If the audience has little interest in the topic, present conclusions first. If the audience is interested, but negative, present arguments first, followed by conclusions. Present various points of view. If the audience is not familiar with the arguments, then present favorable points first, but if they are familiar. then present con arguments first, and point out weaknesses before presenting the positive points of view. Clearly state the conclusions you want the audience to reach. • Materials should be accurate, carefully designed, and of good quality to promote changes in attitude. • Choose a medium that is considered credible by your audience.

VISUAL DESIGN PRINCIPLES

Media considerations

- When planning printed materials. consider how, where, and by whom they will be used, e.g., materials for poor readers must be designed differently than those for good readers.
- Consider the type of reproduction. Fine detail can be lost in printing of poor quality.
- When planning projected materials consider the ambient light under which these materials will be shown.

Pictures

- Carefully choose the elements that are to be included in a picture. Consider their relevance, simplicity, and harmony.
- When organizing the elements of a picture consider the following aspects:

  viewpoint
  visual pattern
  balance
  emphasis
  unity
  variety

- When making photographs the treatment of the elements is important. Consider:

  lighting
  perspective
  the instant a picture is taken
  focus and sharpness
  value-the lightness or darkness of the picture

- When producing graphic materials, consider:

  the graphic style
  perspective
  the technical quality

Graphs and diagrams	• Line graphs are particularly useful in showing trends over a period of time and relationships between two or more factors. • Bar graphs are effective for comparing magnitude or size. • Pie charts (or circle graphs) are good for showing the relationship between a whole and its parts. • Simplicity is particularly important in graphs and diagrams for instructional purposes. • Numeric scales and data points on graphs should be carefully chosen to avoid confusion, misinformation, or ambiguity. • Symbols employed in graphs and diagrams should not be arbitrarily selected and should be familiar to all persons in the audience.
Words-projected	• Limit the number of points to be made in a visual employing words. • Use key words, not sentences. • The number of words in a visual should be no more than 15-20. • List items in columns. • For good legibility, lettering should be no smaller than 1/24th the short dimension of the artwork. • Use a simple serif or sans serif style of lettering. • Remember, medium weight lettering is generally best. • When there are several lines of type use a mixture of upper and lower case letters, as appropriate and grammatically correct, to improve legibility.

- Consider the mood of the type face and how it relates to the subject matter.
- Leave adequate space between letters, words, and lines.
- Maintain a moderate to high contrast between the lettering and its background.

Words-print

- Line length should fit a typical group of words. Optimal line length is 39 characters and 25 to 50 is the acceptable range.
- 55 lines has been found to be an ideal page length.
- Right justification is not necessary; it increases cost and studies show it reduces reading speed.
- A variety of page organizations can be used, but within one document a consistant organization should be followed.
- All illustrations should be closely related to the text.
- When explaining a process use one illustration per step.
- Use a list or outline of the content to help learners in organizing information.
- Use bullets, numbers, or white space to separate and focus attention on key items.
- The type size range for good readability is 9 to 12 points. Use the larger sizes if the x height is small.
- Even though there is a slight preference for serif typefaces any simple serif or sans serif typeface can be used, but avoid condensed typefaces.

- As with projected visuals, do not use lines of all capital letters, but use a mixture of upper and lower case letters.
- A medium stroke width is preferred to a very light or very heavy stroke width.
- Consider spacing between words and lines. Adequate space between lines increases readability.
- Maintain a high contrast between type and the background. However, avoid white or light letters on a dark background.

Color

- Consider the context in which a color will be viewed- what colors are to be seen simultaneously or sequentially?
- Use the spectral extremes, red and blue, to attract attention.
- When acuity is important, employ colors in the middle of the spectrum.
- For optimum legibility maintain a high brightness contrast between an image and its background.
- Photographing colored objects demands the use of an appropriate film and judicious lighting to assure good color rendition.
- Saturated cool or warm colors are appropriate for small children. Less saturated cool colors may be more suitable for adults.
- Consider the meaning of colors as they relate to your audience.
- To attract attention use extremes of value or chroma.

- To achieve harmony use familiar color schemes, organize carefully, and employ colors with similar attributes.

- Research shows that color creates interest and that people prefer color to black and white.

- Easily named colors aid memory more than colors that have complex names.

- Use color to provide structure, to emphasize relevant cues, to differentiate central from peripheral information, and to make distinctions between elements of a visual.

TEXT DESIGN PRINCIPLES

Content

- When developing the content for textual materials, consider the audience, the information to be presented, and the way the audience will process the information.
- Include all essential content and eliminate extraneous information.
- Link new material with what the learners already know.

Writing style

- Use an appropriate reading and vocabulary level.
- Short consise statements with concrete, familiar words will significantly aid your readers.
- Use active language and visual and verbal analogies.
- Use diagrams or algorithms where appropriate. These will not only add interest, but will greatly assist the reader in learning the material.

AUDIO DESIGN PRINCIPLES

Functions

- Use the audio track to identify or describe visual elements, but, avoid excessive redundancy.
- The audio track can add supplementary information that cannot be expressed visually, and it can be employed to reinforce visual messages. Be certain, however, that the two modes (audio and visual) do not convey different meanings.
- Use verbal cues to organize the viewer's visual perceptions.
- The design of the audio track should optimize visual-verbal flow.

Structure

- Maintain a logical organization: Use organizers such as "step 1, step 2 etc." or use preliminary statements that indicate what is to follow.
- Maintain simplicity by breaking complex ideas into simple ones, avoiding extraneous information, unwanted sounds, or misplaced pauses.
- Be certain the narrative style is appropriate to your listeners.
- Start with information that is motivational so the benefits of paying attention will be self-evident.
- Create variety by changing the volume, pace, or voice about every 20 to 30 seconds depending on the audience and the objectives.
- Involve your audience with questions or pauses for discussion.
- Tell the learners what you are going to tell them, tell them again, then tell them what you told them.

The recording

- Write for listening, not reading.
- Avoid complex sentences and use familiar words.
- Employ short phrases that will give the listener time to comprehend and synthesize the material.
- An informal conversational style is best.
- Avoid any wording that would cause the narrator to falter.
- Be sure to choose a credible narrator and one who is appropriate to the audience.
- Two or more voices add variety and can increase attention and interest.
- The delivery rate must be suitable to the audience and the subject matter.
- Be sure the narrator uses correct pronunciation and emphasis.
- Choose suitable music.
- Avoid any musical score that might compete with the narration.
- Use sound effects to create realism and to add interest and emphasis. Be certain they are realistic and that they are employed judiciously.

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